London Borough of Waltham Forest Air Quality Annual Status Report for 2022

Date of publication: 31st May 2023

This report provides a detailed overview of air quality in London Borough of Waltham Forest during 2022. It has been produced to meet the requirements of the London Local Air Quality Management (LLAQM) statutory process[1].

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[1] LLAQM Policy and Technical Guidance 2019 (LLAQM.TG(19))

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Abbreviations

Abbreviation	Description
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
BEB	Buildings Emission Benchmark
CAB	Cleaner Air Borough
EV	Electric Vehicle
GLA	Greater London Authority
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LLAQM	London Local Air Quality Management
NRMM	Non-Road Mobile Machinery
PM_{10}	Particulate matter less than 10 micron in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micron in diameter
TEB	Transport Emissions Benchmark
TfL	Transport for London

Table A.   Summary of National Air Quality Standards and Objectives

Pollutant	Standard / Objective (UK)	Averaging Period	Date[1]
Nitrogen dioxide (NO_2)	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
Nitrogen dioxide (NO_2)	40 µg m^{-3}	Annual mean	31 Dec 2005
Particles (PM_{10})	50 µg m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
Particles (PM_{10})	40 µg m^{-3}	Annual mean	31 Dec 2004
Particles ($PM_{2.5}$)	20 µg m^{-3}	Annual mean	2020
Particles ($PM_{2.5}$)	Target of 15% reduction in concentration at urban background locations	3-year mean	Between 2010 and 2021
Sulphur dioxide (SO_2)	266 µg m^{-3} not to be exceeded more than 35 times a year	15-minute mean	31 Dec 2005
Sulphur dioxide (SO_2)	350 µg m^{-3} not to be exceeded more than 24 times a year	1-hour mean	31 Dec 2004
Sulphur dioxide (SO_2)	125 µg m^{-3} mot to be exceeded more than 3 times a year	24-hour mean	31 Dec 2004

Notes:

(1) Date by which to be achieved by and maintained thereafter

1. Air Quality Monitoring

1.1   Locations

Table B.   Details of Automatic Monitoring Sites for 2022

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA? If so, which AQMA?	Distance to Relevant Exposure (m)	Distance to Kerb of Nearest Road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Monitoring technique
WL1	Dawlish Rd	538380	186717	Urban Background	Y	5.5m	15m	3.5m	NO_2, $PM_{10,}$ $PM_{2.5}$	Chemiluminescent; NOx analyser
WL4	Crooked Billet Roundabout	537468	191071	Kerbside	Y	11m	0.5m	2m	NO_2, PM_{10}	Chemiluminescent; NOx analyser
WL5	Ruckholt Close	537804	186025	Roadside	Y	8m	1.5m	3.5m	NO_2, PM_{10}	Chemiluminescent; FDMS; NOx analyser

Table C. Details of Non-Automatic Monitoring Sites for 2022

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA? If so, which AQMA?	Distance to Relevant Exposure (m)	Distance to Kerb of Nearest Road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor. (Y/N)
A01	City Tree Leytonstone Station	539218	187382	Kerbside	Y	15.0	4.0	2	NO2	N
A02	City Tree Thatched Roof	539125	185633	Kerbside	Y	10.0	4.0	2	NO2	N
A03	Shernhall St, Greville Rd	538311	190904	Roadside	Y	5.0	5.0	2	NO2	N
A04	Blackhorse Rd in front of St Patricks Catholic School	536048	189159	Roadside	Y	0.2	2.2	2	NO2	N
A05	Boundary Rd & Hoe St	537600	188251	Roadside		3.5	0.2	2	NO2	N
A06	Chestnuts House on Hoe St	537498	188436	Roadside		9.0	2.2	2	NO2	N
A07	Chingford Assembly Hall	538699	194426	Roadside	Y	4	2.2	2	NO2	N
A08	Connaught School	539024	186945	Roadside		6.0	1.8	2	NO2	N
A09	Dawlish Rd (playground area next to 195 Dawlish Rd)	538400	186734	Roadside		2.5	4.5	2.4	NO2	N
A10	Forest Rd and Melville Rd	536938	189753	Roadside	Y	0.5	4.5	2	NO2	N

A11	Francis Rd & High Rd Leyton	538022	187162	Roadside	Y	13	2	2	NO2	N
A12	Gloucester Rd & Lea Bridge Rd	537088	187632	Roadside	Y	3.5	0	2	NO2	N
A13	Howard Rd & Church Rd	537583	189310	Roadside	Y	3.5	2.2	2	NO2	N
A14	Kings Rd & Kingswood Rd	539259	187567	Roadside	Y	1.8	2.5	2	NO2	N
A15	Lea Bridge Rd (entrance of Lea Valley Riding School)	535928	186914	Roadside	Y	0	2	2	NO2	N
A16	Lea Bridge Rd and Perth Rd	536457	187238	Roadside	Y	2	1	2	NO2	N
A17	Leyton Library	538243	186286	Roadside	Y	4.5	3.8	2	NO2	N
A18	Oliver Rd and Ruckholt Rd	538022	186126	Roadside	Y	0.5	2	2	NO2	N
A19	Pembroke Rd & Grosvenor Park Rd	537719	188685	Kerbside	Y	1.75	0.2	2	NO2	N
A20	Queens Rd near the Cemetery	536951	188436	Roadside	Y	10.5	2.7	2	NO2	N
A21	Radlix Rd and Church Rd	537251	187156	Roadside		13.0	0.8	2	NO2	N
A22	Ruckholt Close	537937	186109	Roadside	Y	13	0	2	NO2	N
A23	Vicarage Rd near St Josephs Junior	537620	187387	Kerbside		8.8	0.2	2.2	NO2	N
A24	Winns Ave junct Mersey Rd	536887	189998	Roadside		22.0	0.5	2.2	NO2	N
A25	Aymler Rd	539563	187517	Roadside	Y	22	0.5	2	NO2	N
A26	Chingford Road junct Loxham Rd	537455	191429	Roadside	Y	12	0.2	2	NO2	N

A27	Hale End Road (~230-240)	538632	191096	Roadside	Y	6	0.8	2	NO2	N
A28	Hall Lane o/s retail park	538863	191080	Roadside		5.0	1.2	2	NO2	N
A29	Winchester Rd (~160-170)	538863	191080	Roadside	Y	3	0.5	2	NO2	N
A31	James Lane Leytonstone School	539034	188244	Roadside	Y	12	2.2	2	NO2	N
E01	Mornington Rd and High Rd Leytonstone	539664	187618	Roadside	Y	2	1.5	2.2	NO2	N
E02	Coppermill School Edward Road	535942	188731	Roadside	Y	6	2.2	2	NO2	N
E03	William Marshall Cl and S. Access Rd	536251	188272	Roadside	Y	3.5	1.2	2	NO2	N
E04	Argalway Foot Bridge	535891	187365	Roadside	Y	160	4	2.2	NO2	N
E05	Veralum Ave	536593	187974	Roadside	Y	4.5	1.2	2.2	NO2	N
E06	Markhouse Rd opposite Acacia Rd	536644	188089	Roadside	Y	15	2.5	2.2	NO2	N
E07	Station Rd junct with Buxton Rd E4	538954	194512	Kerbside	Y	12	0.2	2	NO2	N
E08	86 Palmerston Road	536619	189322	Roadside	Y	4.5	2.5	2.2	NO2	N
E09	Chingford Road junct Penhryn Cres	537536	190697	Kerbside	Y	5	0.2	2	NO2	N
E10	Forest Rd Bell Corner	537431	189784	Roadside	Y	10	0.2	2	NO2	N
E11	Forest Road junct Wood St	538295	189964	Kerbside		25.0	0.2	2.2	NO2	N

E12	Friday Hill junct Normanton Pk	539129	193377	Kerbside		5.0	0.2	2.2	NO2	N
E13	Fulbourne Rd	538123	190790	Kerbside	Y	5	0.2	2	NO2	N
E14	Hale End Road junct The Avenue	538588	191750	Roadside	Y	2.8	0.2	2	NO2	N
E15	High Rd E10 junct Buckingham Rd	538072	186479	Roadside	Y	0	3.5	2	NO2	N
E16	High Rd E10 junct Etchingham Rd	538386	185800	Roadside	Y	3	2.7	2.2	NO2	N
E17	High Rd E11 junct West St	539227	186335	Kerbside	Y	1.8	0.8	2.2	NO2	N
E18	Higham Hill junct Forest Road	536547	189641	Roadside		5.6	2.0	2.4	NO2	N
E19	Higham Hill Rd junct Claremont Road	536226	190223	Roadside	Y	5.6	2	2	NO2	N
E20	Larkshall Rd junct Dale View Cres E4	538627	193361	Roadside	Y	6	2.4	2	NO2	N
E20	Larkshall Rd junct Dale View Cres E4	538627	193361	Roadside		10.0	2.0	2.4	NO2	N
E21	Lea Bridge Rd Bakers Arms	537792	188144	Kerbside		0.0	0.5	2.4	NO2	N
E23	Old Church Rd o/s Mansfield Park	537660	193854	Kerbside	Y	11	0.2	2	NO2	N
E24	Selbourne 1 (South Grove)	536732	188811	Roadside	Y	45	0.4	2	NO2	N
E25	Selbourne 2	536791	188897	Kerbside	Y	49	0.4	2.2	NO2	N
E26	Selbourne 3	536999	188939	Kerbside	Y	45	0.4	2.5	NO2	N

E27	Selbourne 4	537142	188976	Roadside	Y	55	2.5	2.5	NO2	N
E28	Francis Road	538321	186872	Roadside	Y	4	0.8	2	NO2	N
E29	Orford Road	537786	188946	Roadside		5.0	0.8	2.2	NO2	
E30	Woodville Mornington	539707	187463	Roadside	Y	5	0.8	2.2	NO2	N
E31	Shernall St Grenville Rd	538359	188999	Roadside	Y	5	5	2.2	NO2	N

1.2 Comparison of Monitoring Results with AQOs

The results presented are after adjustments for "annualisation" and for distance to a location of relevant public exposure (if required), the details of which are described in Appendix A.

Table D. Annual Mean NO$_2$ Ratified and Bias-adjusted Monitoring Results

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
WL1	Automatic	N/A	99	30	28	23	24	19	18	20
WL4	Automatic	N/A	82	**47**[d]	**46**[d]	**43**[d]	**43**[d]	33[d]	31[d]	30
WL5	Automatic	N/A	94	35	33	30	31	25	23	22
A01	Diffusion	N/A	75							24.4
A02	Diffusion	N/A	67.3							22.9
A03	Diffusion	N/A	92.3	**40.8**	38.1	37.4	33.9	31.5		22.6
A04	Diffusion	N/A	100	**52.6**	**49.4**	**44.6**	**45.2**	32.4	28.7	29.9
A05	Diffusion	N/A	92.3	**46.4**	**43.1**	**41.6**	**41.6**	37.3		27.3
A06	Diffusion	N/A	92.3	**43.2**	**40.2**	32.7	36.3	34.7		30.0
A07	Diffusion	N/A	100	27.2	25.3	29.6	29.7	22.4	20.8	21.6
A09	Diffusion	N/A	75	28.9	27.3	22.8	25.1	21.5		16.7
A10	Diffusion	N/A	92.3	37	33.6	33.1	31	22.1	21.7	20.9
A11	Diffusion	N/A	100	37.8	35.1	30.9	30.2	22.8	23.8	21.5
A12	Diffusion	N/A	84.6	**43.1**	**40.9**	38.6	38.3	27.7	26.7	25.8
A13	Diffusion	N/A	100	36.5	35.4	31	31.2	22.4	20.6	20.6
A14	Diffusion	N/A	100	38.5	36.9	32	32.9	22	23.2	21.3
A15	Diffusion	N/A	100	30.6	29.2	27.3	27.1	20	20.3	19.9
A16	Diffusion	N/A	92.3	38.6	37.8	31.7	31.6	23.6	23.7	22.1
A17	Diffusion	N/A	63.5	**51.7**	**50.6**	37	**41.2**	36.6	35.1	31.8

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
A18	Diffusion	N/A	100	**53.8**	**49.3**	**44.7**	**43**	33.2	32.5	29.9
A19	Diffusion	N/A	100	33.8	32.8	28.1	29.6	21.1	19.6	21.4
A20	Diffusion	N/A	100	34.8	31.8	28.4	28.5	20.6	19.7	19.6
A21	Diffusion	N/A	92.3	39.1	38.7	39.5	32.5	30.3		30.8
A22	Diffusion	N/A	100	**41.8**	**40.6**	34.6	35.8	25.7	25.6	24.5
A23	Diffusion	N/A	67.3	33.8	30	26.4	26.6	21.9		17.8
A24	Diffusion	N/A	92.3			29.6	28.1	18.8		18.0
A25	Diffusion	N/A	92.3	35.6	32.7	29.8	37.4	28.5	29.5	26.1
A26	Diffusion	N/A	100			34.2	35.1	27.5	38.1	29.6
A27	Diffusion	N/A	92.3			34.2	36.6	25.5	24.5	25.7
A28	Diffusion	N/A	92.3			38.5	38.9	33.3		34.0
A29	Diffusion	N/A	92.3			**48.7**	35.2	27.5	27.9	25.5
A30	Diffusion	N/A	17.3			**45**	26	18	-	-
A31	Diffusion	N/A	100			38.3	37.6	29.4	29.4	24.5
E01	Diffusion	N/A	100					35.7	34.1	33.8
E02	Diffusion	N/A	90.4			34.6	28.4	19	16.3	16.0
E03	Diffusion	N/A	92.3			39.3	27.2	18.6	17	17.3
E04	Diffusion	N/A	100					22.6	23.8	23.1
E05	Diffusion	N/A	92.3					25.6	18.1	18.4
E06	Diffusion	N/A	100					27.3	26.2	28.8
E07	Diffusion	N/A	100			**50.3**	33.1	22.4	24.5	25.3
E08	Diffusion	N/A	92.3			**43.7**	36.1	28.5	27.8	24.8
E09	Diffusion	N/A	100			**46.4**	35.6	26.1	25.9	25.6
E10	Diffusion	N/A	100			30.2	38.1	32.3	35.2	33.0
E11	Diffusion	N/A	82.7			27.3	**40.8**	31		28.3
E12	Diffusion	N/A	92.3			**50.9**	29.4	17.5		18.7

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
E13	Diffusion	N/A	92.3			**43.5**	36	25.4	24.6	24.3
E14	Diffusion	N/A	100				39	35.9	22.9	26.8	26.7
E15	Diffusion	N/A	92.3	**42.9**	39.9	**40.7**	36.6	28.3	27.6	25.0
E16	Diffusion	N/A	100	<u>**61.4**</u>	**57.3**	**59.6**	**47.2**	38.2	35	34.5
E17	Diffusion	N/A	100	<u>**61**</u>	<u>**61**</u>	**57**	**40.9**	32.4	34	32.0
E18	Diffusion	N/A	92.3	**44.3**	**45.8**	**43.2**	37	30.6		31.4
E19	Diffusion	N/A	100				31.6	22.1	20.6	21.4
E20	Diffusion	N/A	75				27.4	19.9	19.6	17.2
E21	Diffusion	N/A	92.3				**51.5**	30.7		35.0
E22	Diffusion	N/A	92.3				**46.3**	27.3		32.1
E23	Diffusion	N/A	92.3				30.2	28.5	28.5	27.4
E24	Diffusion	N/A	100	**42.9**c	39.9	**40.7**c	**42.7**c	34.4	25.9	30.1
E25	Diffusion	N/A	100	<u>**61.4**</u>c	**57.3**c	**59.6**c	**58.4**c	**47.6**c	**46.2** c	36.2 c
E26	Diffusion	N/A	100	<u>**61**</u>c	<u>**61**</u>c	**57**c	**58.0**c	**41.6**c	**40.4** c	36.6 c
E27	Diffusion	N/A	67.3	**44.3**c	**45.8**c	**43.2**c	39.6	29.5	29.4	30.0
E28	Diffusion	N/A	92.3				30.7	20.8	22	20.0
E29	Diffusion	N/A	100				29.6	27.9		21.1
E30	Diffusion	N/A	90.4					31.7	24.8	20.4
E31	Diffusion	N/A	92.3			29.9	27.4	23.7	20.1	33.7

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the NO$_2$ annual mean AQO of 40 µg m^{-3} are shown in **bold**.

NO$_2$ annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO$_2$ hourly mean AQS objective are shown in **<u>bold and underlined</u>**.

Means for diffusion tubes have been corrected for bias.

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%.

Results have been distance corrected where applicable.

(a) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

(c) Nearest relevant receptors are further than 20m from monitoring site. These locations were deployed to monitor the several council interventions at the roadside and not at a relevant receptor, therefore these results shown are not adjusted for distance to relevant exposure.

(d) Fall off distance from roads were not calculated in previous ASRs. These results have been corrected retrospectively.

Table D Shows a reduction in NO_2 at all locations monitored in the borough. 2020 was the first time since we monitored NO_2 using diffusion tubes no locations had pollutant levels over the AQO at relevant exposure. This remains to be the case for 2022.

Figure 1.1 shows the 7-year trends in nitrogen dioxide concentrations in the air quality focus areas identified in our AQAP. There are fourteen monitoring locations situated in or by these focus areas. It shows that there has been a gradual improvement in air quality, albeit that the concentrations at one location still exceeds the annual mean average Air Quality Objective of 40µg/m3 all diffusion tube locations that are adjusted for relevant exposure are below the AQO. Data from 2018 and 2019 suggested that these improvements in NO2 may have plateaued however a significant reduction is seen for 2020, 2021 and 2022. Initially this reduction seemed to be due to the drop in road traffic associated emissions because of COVID-19 restrictions, however 2022 had no restrictions yet the reductions in NO2 were retained. This suggests that local schemes such as LTN's and wider London schemes such as the ULEZ expansion have helped to keep NO2 levels from reverting to pre COVID-19 levels.
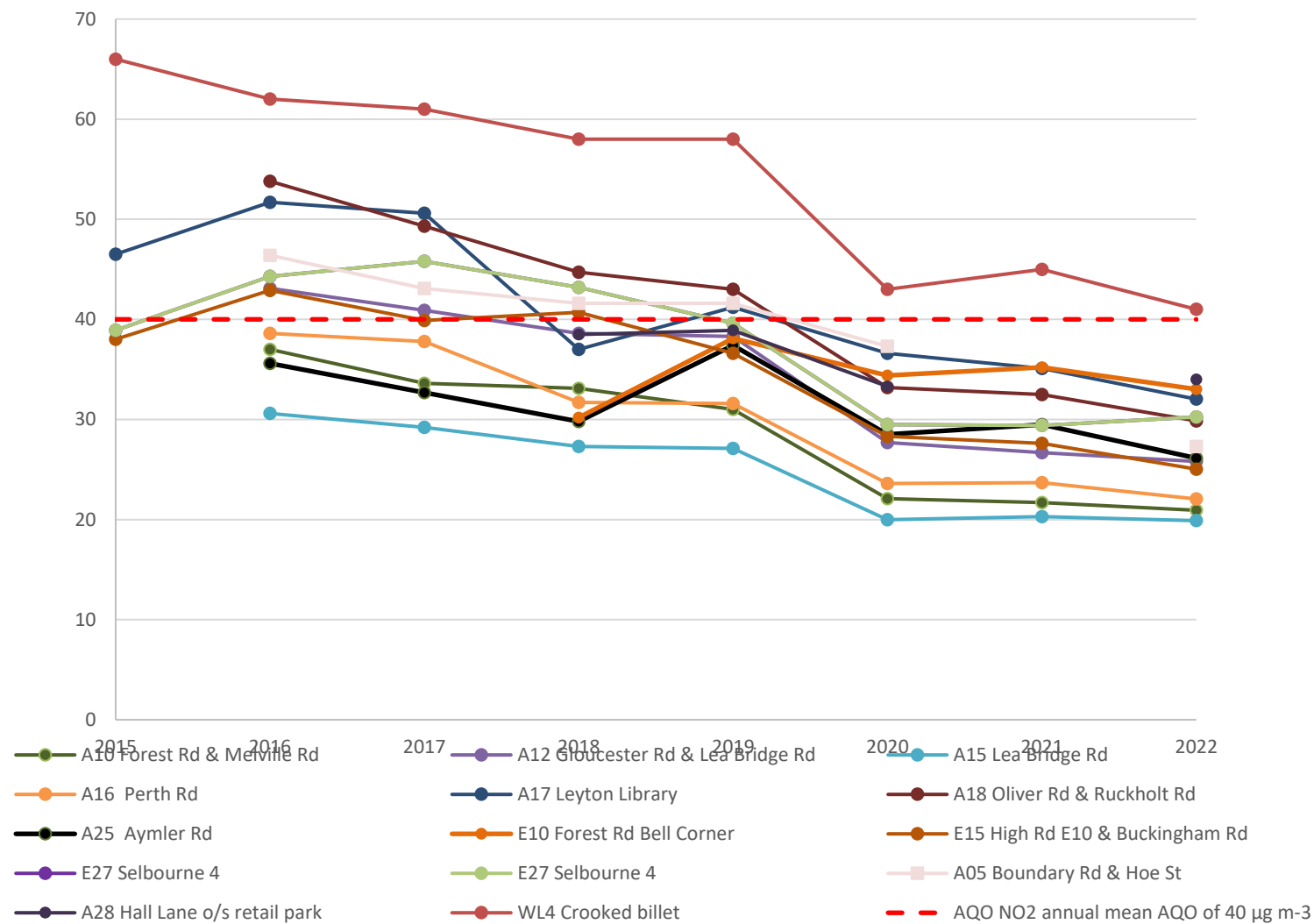
Figure 1.1 Trends in Nitrogen Dioxide Concentrations in AQ focus areas within the London Borough of Waltham Forest 2015-2022

Table E. NO$_2$ Automatic Monitoring Results: Comparison with 1-hour Mean Objective, Number of 1-Hour Means > 200 µg m^{-3}

Site ID	Valid data capture for monitoring period %([a])	Valid data capture 2022 %([b])	2016	2017	2018	2019	2020	2021	2022
WL1 Dawlish Road	N/A	99	0	0	0	0	0	0	0
WL4 Crooked Billet	N/A	82	15	0	0	2	0	0	0(121)
WL5 Ruckholt Close	N/A	94	0	0	0	0	0	0	0

Notes

Results are presented as the number of 1-hour periods where concentrations greater than 200 µg m^{-3} have been recorded.

Exceedance of the NO$_2$ short term AQO of 200 µg m^{-3} over the permitted 18 hours per year are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(a) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

(b) Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

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Table F.   Annual Mean PM$_{10}$ Automatic Monitoring Results (μg m^{-3})

Site ID	Valid data capture for monitoring period %(^{a})	Valid data capture 2022 %(^{b})	2016	2017	2018	2019	2020	2021	2022
WL1 Dawlish Road	N/A	97	18	18	17	19	17	15	15
WL4 Crooked Billet	N/A	95	29	29	28	29	25	23	25
WL5 Ruckholt Close	N/A	98	19	19	18	19	17	15	15

Notes

The annual mean concentrations are presented as μg m^{-3}.

Exceedances of the PM$_{10}$ annual mean AQO of 40 μg m^{-3} are shown in **bold**.

All means have been "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75% and more than 25%.

(a) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(b) Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Table G. PM$_{10}$ Automatic Monitoring Results: Comparison with 24-Hour Mean Objective, Number of PM$_{10}$ 24-Hour Means > 50 µg m^{-3}

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
WL1 Dawlish Road	N/A	97	18	18	17	19	1	0	0
WL4 Crooked Billet	N/A	95	29	29	28	15	10	5	6
WL5 Ruckholt Close	N/A	98	19	19	18	19	4	1	3

Notes

Exceedances of the PM$_{10}$ 24-hour mean objective (50 µg m^{-3} over the permitted 35 days per year) are shown in **bold.**

Where the period of valid data is less than 85% of a full year, the 90.4th percentile is provided in brackets.

(a) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Table H. Annual Mean PM$_{2.5}$ Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
WL1 Dawlish Road	N/A	96	-	-	-	12	10	9	10

Notes

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the PM$_{2.5}$ annual mean AQO of 20 µg m^{-3} are shown in **bold**.

All means have been "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75% and more than 25%.

(a) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(b) Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
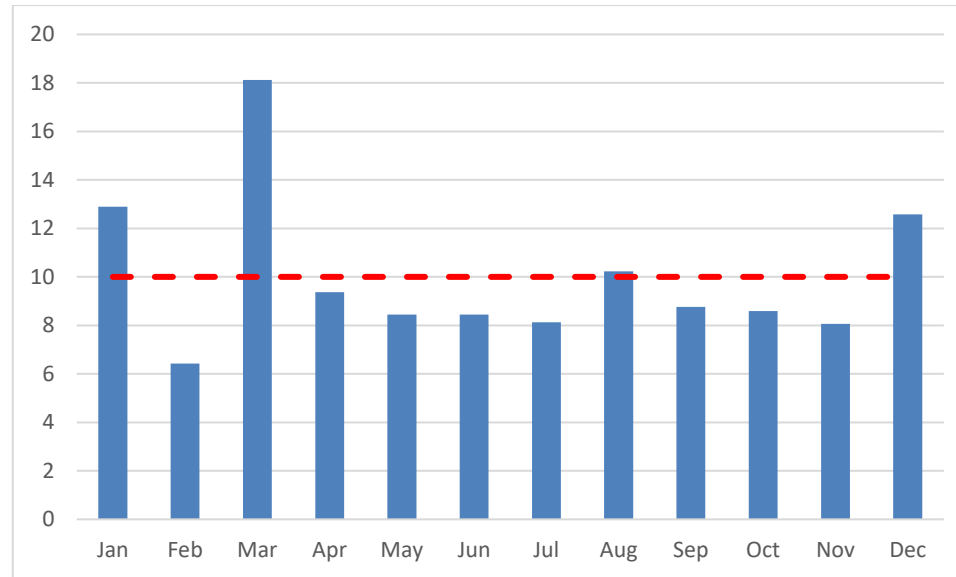
Figure 1.2 Trends in monthly PM$_{2.5}$ concentrations within the London Borough of Waltham Forest compares to the PM$_{2.5}$ AQO.

There is significant month-month variation in PM$_{2.5}$ with March highest at 18µg m^{-3}. This variation doesn't appear to correspond to any seasonal changes or road traffic levels. This suggests that sources other than local urban traffic such as domestic, industrial and secondary PM are at play. PM$_{2.5}$ can travel over long distances. The prevailing wind for London is west-southwest as Waltham Forest is in the north east of London which suggests that winds will carry PM from central London to Waltham Forest.
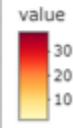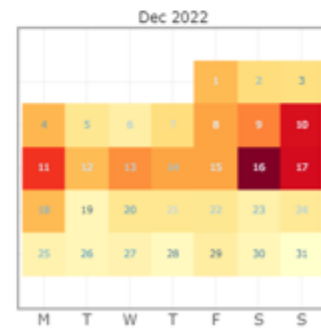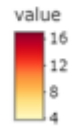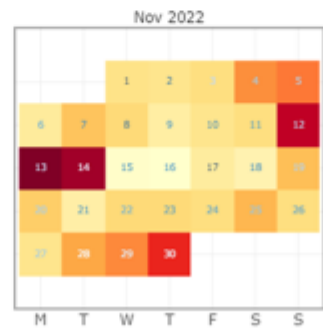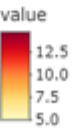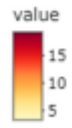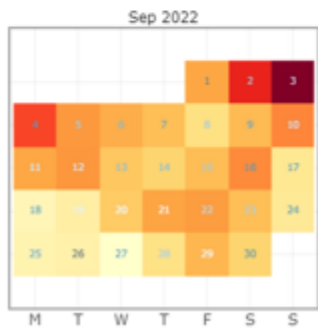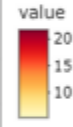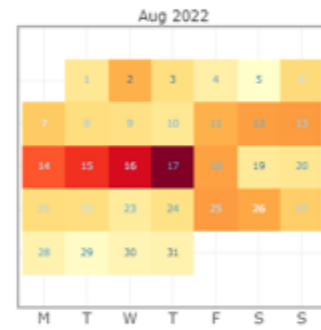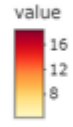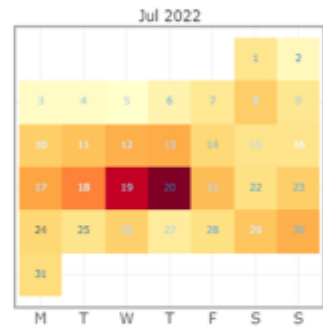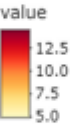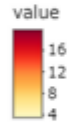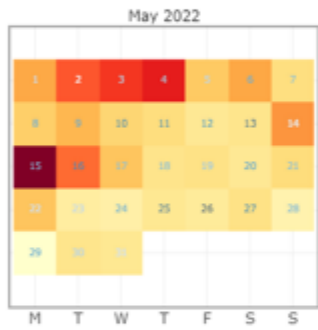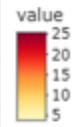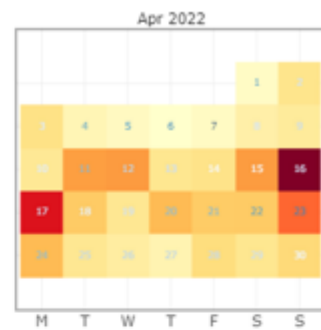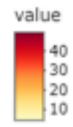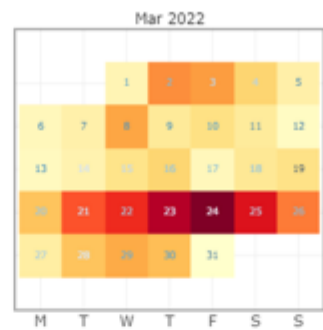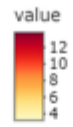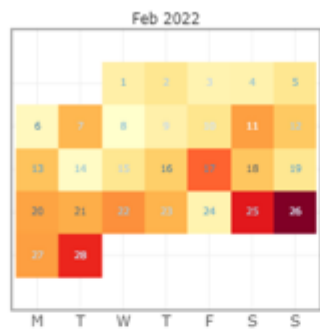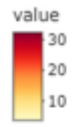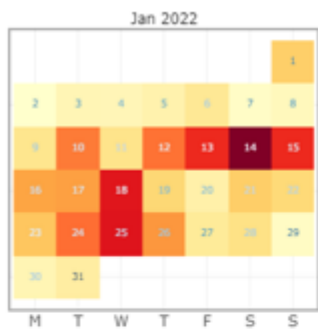
Figure 1.3 Daily variation in $PM_{2.5}$ concentration as laid out in a calendar style. This allows intuitive viewing of day to day headline trends in the wider context of the period. The background colours shown for each day relate to the concentration.

From Figure 1.3 we can see that there does appear to be a large range in daily averages. It appears that most days have very low $PM_{2.5}$ averages. There are spikes throughout the year when $PM_{2.5}$ are significantly elevated for a few days. The peaks in November and January are likely due to bonfires and fireworks for festivities such as New Years Eve, Guy Fawkes night and Diwali.

Figure 1.4 The back trajectory plot shows data from the HYSPLIT model (NOAA HYSPLIT 3) run in analysis mode. This shows the air mass back trajectories associated with top ten most polluted days in April (highest 2022 monthly mean for $PM_{2.5}$); these provide information on the trajectory direction associated with the top 10 measured concentrations.

Under some meteorological conditions, air polluted with $PM_{2.5}$ from the continent may circulate over the UK – a condition known as the long-range transportation of air pollution. Long-range transport, together with pollution from local sources, can result in short term episodes of high pollution which might have an impact on the health on those sensitive to high pollution. This could be an explanation to the spikes observed in the calendar plot in figure 1.3.

Figure 1.4 looks at the air mass back trajectories for high pollution days recorded at WL4 (Dawlish Road). This gives us information on where air travelled over before reaching London, picking up pollutants on the way. From the plots of the top ten most polluted days we can see that most of these days had winds coming across from the continent and suggests that these short-term episodes of high pollution are due to long range transportation of air pollution

2. Action to Improve Air Quality

2.1 Air Quality Action Plan Progress

Table J provides a brief summary of London Borough of Waltham Forest's progress against the Air Quality Action Plan, showing progress made this year. New projects which commenced in 2022 are shown at the bottom of the table.

Completed
Ongoing
Outstanding from original plan
New items yet to commence

Table J.   Delivery of Air Quality Action Plan Measures

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
Ensuring emissions from construction are minimised			
Action1	Emissions from developments and buildings	Every major development will have a construction management condition.	• Please see planning update (Table K).

Action 2	Emissions from developments and buildings	Every major development will have a Non Road Mobile Machinery condition, and compliance will be checked via spot checks at development sites.	From 2019 onwards all major developments are required to have discrete conditions for: • Air Quality Dust Management Plan (AQDMP) • Non Road Mobile Machinery (NRMM)
Action 3	Emissions from developments and buildings	All developments with CHP and biomass plant will have a condition to ensure that it meets the standards for emissions from the combined heat and power and biomass plants set out in the Sustainable Design and Construction SPG and use ultra-low NOx boilers.	Waltham Forest are part of the pan London NRMM project led by Merton. For 2022, 13 sites have been audited and 11 sites were found to be compliant. 2 sites were found to be non-complaint. These sites are being chased to encourage compliance.
Action 4	Emissions from developments and buildings	All developments shall meet the Air Quality Neutral Emissions Benchmarks for Buildings and Transport set out in the Sustainable Design and Construction SPG.	
Action 5		An Informative will be placed on all relevant planning applications for the developer to consider "First Steps in Urban Air Quality". A Trees and Design Action Group (TDAG) Guidance Document	The implementation of this action is under consideration. In regard to planning applications the tree service: • Only remove trees if they are Dead Dying Dangerous or implicated in an insurance claim • If trees must be removed, then we would preferably like their CAVAT, with which we will use to plant more trees • The minimum we expect is 3 trees for every 1 removed

			The figures for this years (Nov – March 20/21) tree plantings are:- Street trees 862 Whips 8000 Total 8862.
Action 6a, Action 6b	Public health and awareness raising	To improve information relating to the Smoke Control Areas on the council's web site. Action 6b: To prepare an advice leaflet for residents on authorised fuels and exempt appliances, which will be distributed at point-of-sale locations for fuel and wood burners. Action 6c: To prepare a planning informative for new solid fuel burners.	In 2021, Waltham Forest was part of a DEFRA bid for a large communication campaign across 13 London Boroughs on particulate matter and domestic burning. The bid was successful, and the project is due to start on the 26 April 2022. In 2022, the Defra wood burning project has started including the three research elements of the project which are underway: • Resident survey with Opinium Research • Real-world home measurements with Imperial • Health Impacts Assessment with Ricardo
Action 6d, Action 6e,	Emissions from developments and buildings	To promote the Waltham Forest waste collection service for garden waste via "Waltham Forest News" in order to prevent bonfires.	In 2022 the council sent out over 53 letters in relation to SCA or bonfire complaints. These letters contained advise

Action 6f		To publicise Information on the adverse health effects of smoke from bonfires An Annual review of number of bonfire enforcement interventions	and discourage burning and measures that will mitigate smoke pollution if people insist on having a bonfire. The council's AQ webpage has been revamped in 2021 to improve information on the adverse health effects on burning, promote the council's free garden waste collections and discourage bonfires.
Action 7, Action 7a	Emissions from developments and buildings	Promoting and delivering energy efficiency retrofitting projects in workplaces and homes using the GLA RE:NEW and RE-FIT programmes to replace old boilers / top up loft insulation in combination with other energy conservation measures. Annual reporting on HECA and number of boilers updated.	Waltham Forest's efficiency retrofitting projects are now primarily through the following schemes. • **Warm Homes Funding;** The Council has received Warm Homes Fund Category 1 and 3 funding to run to end of the year, which is used to fund a local organisation (The HEET Project) to provide improvement measures to properties of qualifying residents and energy efficiency advice etc. • **Green Homes Grant Funding;** The Council was successful in a bid for the first phase of Green Homes Grant LAD funding. From this initial allocation, a total of 109 properties will be retrofitted through the grant. Of these, 89 will be non-council owned properties from an eligibility pool of 883 properties. For both council owned and non-council homes, the focus of the bid will be on installing external wall insulation. The Council was also successful in a further bid for Green Homes Grant LAD funding in phase 1b. This will enable works to 100 properties, including 20 council-owed properties. • **Council Housing Energy Centre;** In 2019, the regeneration of council properties within an estate included the construction of an Energy Centre. This supplied energy to 580 existing and new homes on

			the estate with plans to extend the networks coverage to a further 400 houses and public sector buildings. The centre uses natural gas to produce electricity, which is then sold to the National Grid
Action 8	Public health and awareness raising	Work to ensure that Public Health Teams are supporting engagement with local stakeholders (businesses, schools, community groups and healthcare providers). This will include briefing the Director of Public Health each year with the Annual Status Report and updating them quarterly on the progress of the actions in this plan.	In 2022 the Public Health and Air Quality & Environmental Protection teams worked collaboratively on a number of projects including: • School Superzones 2 • Promoting AQ workshops information via our education hub. For the School Superzones 2 project AQEP have installed a breathe London monitor near the school: https://www.breathelondon.org/sensor-info?sitecode=CLDP0428&species=both
Action 9a, Action 9b, Action 9c	Public health and awareness raising	Improve the council website with air quality information including the "Living Map", developed as part of the "Enjoy Waltham Forest" project. The map suggests alternative, better AQ walking and cycling routes. Improve local communication with at least one post annually in Waltham Forest News, all projects being tweeted, and all major projects show cased on Council TV screens. Joint Anti-idling project on national Clean Air Day 21st June 2018	Action 9a: COMPLETE The AQ page on the council's website has a section on Walkit.com. This is a web based urban walking route planner that allows you to plan your journeys via less polluted routes. Action 9b: ONGOING. Action 9c: COMPLETE The council held a joint anti-idling project focusing on Walthamstow town centre for clean air day 2018.

Action 10	Public health and awareness raising	Refresh the Waltham Forest's Joint Strategic Needs Assessment which has air quality as a key theme	In December 2018 the council published its Joint Strategic Needs Assessment on Air Quality and Health. This was published by Public Health with input from Air Quality & Environmental Protection. https://www.walthamforest.gov.uk/content/joint-services-need-assessment-jsna COMPLETE
Action 11	Public health and awareness raising	Strengthening coordination with Public Health by ensuring that at least one consultant grade public health specialist within the borough has air quality responsibilities outlined in their job profile (as part of a wider role, not a dedicated air quality post)	The Public Health team are working collaboratively on several projects including: • The School Super Zone Pilot. • Cleaner Air Hospital Project (Please see action 41 for further details). Officer in post, regularly liaises with AQEP team. Ongoing action with AQEP will be covered by action 8. COMPLETE
Action 12	Public health and awareness raising	Director of Public Health to sign off Statutory Annual Reports and all new Air Quality Action Plans	ONGOING
Action 13a, Action 13b, Action 13c.	Cleaner transport	The Head of Transport will be fully briefed on Public Health duties and air quality opportunities and risks related to transport in the borough. Prepare a briefing which can be disseminated amongst the Transport Team. All meetings will be minuted and included in the appendix of future AQAP updates.	Highways and AQEP work very closely teams usually meet every 6 weeks or more frequently. Both teams are briefed on all relevant initiatives. COMPLETE

Action 14	Public health and awareness raising	Air Quality Business Pledge initiative on Clean Air Day 21st June 2018	The AQ business pledge was promoted on CAD 2018. We currently have two businesses who have made AQ business pledge. These businesses have been provided with a toolkit to help businesses include considering AQ as a factor in their businesses building emissions, transportation, and supply chain. COMPLETE
Action 15	Public health and awareness raising	Promotion of airTEXT by running a campaign in the week of national "Clean Air Day" 2018.	Complete: for the period 1st April 2020 to 31st March 2021 Waltham Forest had 31 new subscribers bringing the total to 220. Number of airTEXT Waltham Forest alert Days 1 April 2020 – 31 March 2021: 17 Number of airTEXT alerts sent to Waltham Forest subscribers 1 April 2020 – 31 March 2021: 3374

Action 16, Action 16a	Public health and awareness raising	To run a campaign to promote the Transport for London STARS programme in Waltham Forest.
		
		Working to deliver the recommendations of the audits from the audited schools in this programme
			There are now 66 schools in the borough with TfL STARS accredited travel plans including 41 Gold standard schools which have shown the highest commitment to encouraging active and sustainable travel over the past three years.
			
			STARS
			
			• 66 schools achieved STARS accreditation in 2022 at the following levels:
			   o Engaged – 5
			   o Bronze – 11

			○ Silver – 9 ○ Gold – 41 No Schools in WF were audited in The Mayor's school air quality audit programme. ONGOING
Action 17a, Action17b	Localised solutions	Run "School Streets" trial School Air Quality Ambassadors initiative alongside national Clean Air Day	On national Clean Air Day 2018, all schools were invited to contact us if they would like assistance with trialling "School Streets" initiatives. 22 schools have expressed an interest in having a School Street. In 2019, two trial locations, Byron Road (George Mitchell School) and Marsh Lane (Willow Brook Primary School, St Joseph's Catholic Infant School, and Riverley Primary School) were launched on Monday 23 September. Complete By the end of 2022 WF had 20 school streets with further schemes planned for 2023: https://www.walthamforest.gov.uk/schoolstreets
Action 18	Delivery servicing and freight	Require the Council's waste contractor to have Gold status under the Fleet operator Recognition Scheme.	New waste, street cleansing and ground maintenance contract commenced end of Sept 2019 and runs for 8 years. Includes a requirement for a shift in how vehicles and equipment are powered.

			• Have swapped all of the ground equipment, so leaf blowers etc. from petrol to electric. • Have mandated vehicles under 3.5 tonnes to be electric • Will be having a fully electric dustcart to service the market, as the engines have to be left on to use the lifting and compacting equipment. • Not practical or economically viable for contractors to provide dustcarts using other fuel sources at the time but all are Euro VI diesel COMPLETE (awaiting official confirmation)
Action 19	Delivery servicing and freight	Update Procurement policies to ensure sustainable logistical measures are implemented (and include requirements for preferentially scoring bidders based on their sustainability criteria)	Air Quality is included in the Council's Sustainable Procurement Policy 2015-2019. The council launched a Sustainable Procurement Working Group in July 2019. The council has commenced consultation for a refreshed / new version of the of the Sustainable Procurement Policy. ONGOING
Action 20a, Action 20b, Action 20c, Action 20d	Delivery servicing and freight	Monitor the use and mileage of the Zero Emission Delivery Service and Cargo Bikes. Promote the Zero Emission Delivery Service and Cargo Bikes through the website and Waltham Forest News.	In 2022 ZED: • Number of deliveries – 103,365 • Distance travelled – 84,522km • Estimated CO_{2e} saved – 33.4 tonnes

		The Waltham Forest Construction Consolidation Pilot is being developed by the Asset Management Team	The Council has undertaken significant publicity about this e.g the ZED service has its own Twitter and Instagram accounts @zedwalthamforest
		Monitor the Waltham Forest Sustainable freight initiative and convert this to NOx emissions and report annually.	ONGOING
Action 21	Delivery servicing and freight	Complete a feasibility study on Virtual Loading Bays in town centres during 2019.	The Council's Business Low Emission Neighbourhood (BLEN) project, which is due to be delivered in 2020/2021, will include an investigation of virtual loading bays in Leytonstone. ONGOING
		Borough fleet actions	
Action 25a, Action 25b	Borough fleet	To monitor and report the annual emissions for the staff car club To submit bid to OLEV for workplace EV chargers	In September 2018, electric car charging points were installed at the Town Hall and the vehicles were switched to fully electric. Since that time over 27,500 miles have been driven by the staff and public. The public can book the vehicles out of office hours and at the weekends. Waltham Forest Town Hall now has 6 bays. Two for staff / public 4 for e-car rental / pool cars. Staff Car club: ONGOING Workplace EV Chargers: COMPLETE

		Localised solutions	
Action 26	Localised solutions	To report the actions from the "Strategy for the Planning and Management of the Borough's Urban Forest" annually in the AQAP	The Trees Strategy is available on the Council's website https://www.walthamforest.gov.uk/content/trees With regards to Urban Air Quality, the Tree Service addresses this in two ways 1. Carbon Sequestration, knowledge in this area is constantly improving and The City of London are assisting us to improve our calculation and monitoring systems both for COF funding and tree choice 2. Capture and Retain Airborne Fine Particulate Matter (PM2.5)
Action 27	Cleaner transport	Complete the implementation of the Lea Bridge Road Cycle Route by Autumn 2018	Lea Bridge Road was officially launched on the 17th October 2019, and includes: • Eight kilometres of fully segregated cycle track along the length of the road, • Seven key junction upgrades including Markhouse and Orient Way junction • 52 side roads being transformed into new blended crossings • 33 improved bus stops • Nine new pedestrian and cyclist-controlled crossings Action Complete

Cleaner transport			
Action 28	Public health and awareness raising	To continue to run regular anti-idling campaigns throughout 2018 and 2019	We hold regular anti-idling events on a bi-monthly basis. These focus on education and awareness raising however are attended by our parking / CCTV teams who enforce on inappropriate parking and stopping on yellow lines and our neighbourhood team to provide a uniformed presence and can issue idling fines if needed. COMPLETE
Action 29	Cleaner transport	Lowering the legal speed limit to 20mph in built up residential areas	Completed in most residential areas. COMPLETE (awaiting official confirmation)
Action 30	Cleaner transport	10 new car club bays by March 2019	There are now over 75 car club bays in the borough. COMPLETE
Action 31	Public health and awareness raising	To hold a "Pedestrian Day" on World Car Free Day on 22nd September to promote the improvement of mass transit, cycling, and walking and give communities a chance to see what their town could be like car free	To celebrate World Car Free Day, we held Waltham Forest's largest street party! • Walk-In-Stow - over 5.5km of road was closed in the borough, over 10,000 visitors attended Walk-In-Stow on Hoe Street. • 77 street parties took place in Waltham Forest in 2019. COMPLETE

Action 32	Cleaner transport	Free or discounted parking charges at existing parking meters for zero emission cars	This action will be considered when the Council's parking charges are next reviewed.
Action 33	Cleaner transport	Free or discounted residential parking permits for zero emission cars	All resident permits are charged based on Engine size/CO2 emissions (g/km).
Action 34	Cleaner transport	Emission based charges for Residential and Controlled Parking Zone permits	COMPLETE
Action 35	Cleaner transport	To have the 17 new residential EV charging points fully operational by 2019	WF now has 120 lamp column sockets. 82 fast charging dual sockets. COMPLETE The Council has now adopted a comprehensive Electric Vehicle Charging Point Strategy. A new Action is included as Action 51.
Action 36	Cleaner transport	Installation of rapid chargers to help enable the take up of electric taxis, cabs and commercial vehicles (in partnership with TfL and/or OLEV)	4 rapid chargers has been installed by TfL at the following locations: • Church Lane E11 • High Street car park E17 • Mission Grove car park E17 • Richmond Road car park E4

			SUPERCEDED The Council has now adopted a comprehensive Electric Vehicle Charging Point Strategy. A new Action is included as Action 51.
Action 37	Cleaner transport	Install eight bespoke secure cycle hubs at stations across the borough by the end of 2019	Eight cycle hubs have now been installed. • 88 Bikehangars were installed in 2022for a total of 550 hangers. • Four additional secure cycle parking hubs are proposed in Chingford, Higham's Park and two locations at Blackhorse Road. These will open in summer 2023. ONGOING
Action 38	Cleaner transport	Launch fleet of free to hire modified bikes by Autumn 2018	In December 2018 the council launched a pilot project for fleet of electric pool bikes. • Staff signed up to the scheme – 215 • Total number of hires – 5293 • Total distance cycled – 16,140.80km COMPLETE
		Additional Measures and Actions added since AQAP publication (2018)	

Action 39	Monitoring and other core statutory duties	Research Project with King's College London to be published in July 2018	In 2018 Waltham Forest Council commissioned King's College London's Environmental Research Group to model the impacts of recent road interventions in the borough, particularly the Enjoy Waltham Forest scheme, on air quality. This report has been published on the council website.
			The report found that that measures to prioritise pedestrians and cyclists such as segregated cycle lanes, increased pocket parks and timed road closures had made a marked contribution to improving air quality and health in the borough
			Featured in several news outlets including the evening standard:
			https://www.standard.co.uk/news/london/children-will-live-longer-thanks-to-waltham-forests-mini-holland-cycle-scheme-a3903256.html
			COMPLETE
Action 40	Public health and awareness raising	Develop a Clean Air Hospital Framework for Whipps Cross University Hospital, in partnership with Barts Health NHS Trustand Global Action Plan.	Whips Cross University Hospital Clean Air Action was completed in 2021. COMPLETE

Action 41	Localised solutions	Identify schools that could benefit from green infrastructure and implement greening projects to improve air quality in suitable schools.	A green screen was installed at Woodside Primary in January 2019. A list of schools that were a priority for green screens was complied. These have now all been installed: Sybourn Primary School- Willowbrook Primary School - George Tomlinson Primary School South Grove Primary School Green Leaf Nursery - Barclay School Walthamstow Barclay School Leyton COMPLETE Further school green screen projects have been identified for future green screen rollouts.
Action 42	Monitoring and other core statutory duties	Start Monitoring PM 2.5 in the borough.	In January 2019 a PM2.5 BAM monitor was installed at the Dawlish Road Air Quality monitoring station. COMPLETE

Action 43	Public health and awareness raising	Launch a pedometer challenge to encourage children to walk to school	To celebrate the start of Waltham Forest's year as the first London Borough of Culture, WF contacted all schools in the borough and distributed over 7000 pedometers to schools so pupils can log their steps. COMPLETE South Grove Primary won with a total of 12,071,811 steps. Prizes for winning included four road safety bollards and goodie bags with AQ mini games for all pupils.
Action 44	Localised solutions	To deliver a programme of school streets projects across the borough	By the end of 2022 we had 20 live school street schemes. COMPLETE
Action 45	Cleaner transport	To continue to develop area based schemes to promote walking and cycling and enhance local neighbourhoods	Low Traffic Street Schemes: • Hilltop Area • Coppermill Area • Markhouse Series 4 area • South Leytonstone • School Streets Strategic Cycle Network: • Quietway 2 (Cycle Way 27) • Forest Road • Olympic Park Links • Forest Road • Woodford New Road

			Leytonstone BLEN works have commenced: https://enjoywalthamforest.co.uk/blen/ COMPLETE
Action 46	Cleaner transport	Explore benefits of low cost pollution monitors	Undertake a trial of low-cost pollution monitors to explore the accuracy and value of these monitors. The council has procured 3 Aeroqual AQY monitors and 4 Breathe London Nodes which have been deployed on various projects such as LTN and School Street interventions in the borough. ONGOING
Action 47	Public health and awareness raising	Continue to deliver anti-Idling events and explore enforcement options	Participate in the London wide project. Report on enforcement and events. Explore further enforcement options such as introducing a TMO to increase fines. Waltham Forest promoted the Engines Off campaign via press releases and social media as part of our clean air day communications. Further enforcement options are being considered. ONGOING

Action 48	Localised solutions	Develop an indoor AQ improvement assessment project	Explore indoor air filtration and monitoring options in high relative exposure scenarios such as schools in areas of poor air quality. We are working with TAPAS to look at monitoring options at schools in the borough: https://tapasnetwork.co.uk/
Action 49	Public health and awareness raising	To hold annual events and activities around Clean Air Day and World Car Free Day to promote walking cycling and improved air quality.	Waltham Forest is part of the Healthy Streets Everyday programme which focuses on six key workstreams: 1. Streetscape improvements 2. New traffic regulations to make streets more pedestrian-friendly 3. Car-free events 4. Guidance on how to create Healthy Streets Everyday 5. Communications 6. Evaluation and monitoring of project interventions
Action 50	Public health and awareness raising	Improve the availability of information about air pollution in Waltham Forest for residents, businesses and visitors to the borough.	The air quality section of the Council's website was revamped in 2022.
Action 51	Monitoring and other core statutory duties	Monitor air quality in all Focus Areas and report on air quality improvement projects in these areas.	There are 13 focus areas in the borough. These are: 1. Sewardstone Rd & Kings Head Hill 2. Billet Round About, Chingford Rd, Billet Rd

			3. Hall Lane & North Circular
			4. Southend Rd, Woodford New Rd
			5. Forest Rd, Blackhorse Rd, Blackhorse Lane
			6. Forest Rd & Wood St
			7. Lea Bridge Rd
			8. Whipps Cross Rd & Lea Bridge Rd
			9. Lea Bridge Rd & Markhouse Rd
			10. Hoe St
			11. Hoe St & Selborne Rd
			12. Green Man Round About, Leytonstone High Rd, Gainsborough Rd
			13. Leyton High Rd, Warren Rd, Ruckholt Rd
			Diffusion tubes have now been deployed in all AQ focus areas except for 5. Forest Rd, Blackhorse Rd, Blackhorse Lane as there are ongoing road improvement projects which include works on lampposts. A Breathe London Node has been deployed in this area.
Action 52	Cleaner transport	To support residents and businesses to take up electric vehicles, in order to reduce air pollution caused by vehicle emissions	The Council has adopted an electric vehicle charging point strategy setting out measures and targets to support electric vehicle recharging through to 2025. The key objectives are:

			• Continue to deliver an electric vehicle charging network that meets the demands of residents, businesses and visitors; • Designing sites that take into consideration other road users, particularly pedestrians; • Suitable coverage of the borough by 2025 (our target is for 80% of residents and businesses to be within 250m of a charging point by 2025); • Ensure the charging network has capacity for further expansion; • Encourage the uptake of electric vehicles through initiatives and public engagement; • Identify income opportunities that will lead to the provision and maintenance of charging points becoming cost neutral to the borough • 270 public EV charging sockets were installed in 2022. • WF is on track to deliver 1000 EVCP's by 2023. COMPLETE
Action 53	Emissions from	To improve energy efficiency in privately rented properties with the aim of achieving a minimum EPC standard of 'C'.	This action will primarily be delivered through the Council's property licensing scheme. Targets for this action are being developed

	developments and buildings		
Action 54	Public health and awareness raising	Undertake a second school superzone project.	This project will build on the successes of the pilot superzone project covered by Action 8. a new superzone school project started in 2022 at Mission Grove School. AQ&EP have held idling events and installed an AQ monitor near the school.

3. Planning Update and Other New Sources of Emissions

Table K. Planning requirements met by planning applications in Waltham Forest 2022.

Condition	Number
Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	39
Number of planning applications required to monitor for construction dust	6
Number of CHPs/Biomass boilers refused on air quality grounds	0
Number of CHPs/Biomass boilers subject to GLA emissions limits and/or other restrictions to reduce emissions	
Number of developments required to install Ultra-Low NO$_x$ boilers	All Applicable Major Developments
Number of developments where an AQ Neutral building and/or transport assessments undertaken	11
Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	0
Number of planning applications with S106 agreements including other requirements to improve air quality	8
Number of planning applications with CIL payments that include a contribution to improve air quality	
NRMM: Central Activity Zone , Canary Wharf and Opportunity Areas Number of conditions related to NRMM included. Number of developments registered and compliant. Number of audits % of sites unregistered prior to audit Please include confirmation that you have checked that the development has been registered with the GLA through the relevant NRMM website and that all NRMM used on-site is compliant with Stage Stage IV of the Directive and/or exemptions to the policy.	N/A
NRMM: Greater London (excluding Central Activity Zone, Canary Wharf and Opportunity Areas) Number of conditions related to NRMM included. Number of developments registered and compliant. Number of audits % of sites unregistered prior to audit Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIB of the Directive and/or exemptions to the policy.	11 conditions included 11 registered and compliant 2 unregistered/uncompliant and being chased.

Construction dust monitoring requirements:

For developments assessed to be medium risk or greater for any of the steps required in an Air Quality and Dust Risk Assessment (AQDRA), regular or continuous PM10 monitoring should be carried out on site. Baseline monitoring should commence 3 months before the commencement of works and continue throughout all construction phases. Details of the equipment to be used, its positioning, additional mitigation to be employed during high pollution episodes and a proposed alert system should be submitted to the Council for approval.

Boiler / CHP / Biomass requirements:

Prior to installation, details of the boilers shall be forwarded to the Local Planning Authority for approval. The boilers shall have dry NOx emissions not exceeding 40 mg/kWh (0%). Should the development have CHP or biomass, the CHP and or biomass boilers must not exceed the Band B Emission Standards for Solid Biomass Boilers and CHP Plant as listed in Appendix 7 of the London Plan's Sustainable Design and Construction SPG document and must have a discharge stack which is at least 3m above any openable windows or ventilation air inlets within a distance of 5Um. Prior to the development commencing, evidence to demonstrate compliance with these emission limits will be submitted to the Local Planning Authority for approval.

4. Additional Activities to Improve Air Quality

4.1   NRMM Enforcement Project

Waltham Forest is continuing to support the NRMM Enforcement project in 2023 –

24.

4.2   Climate Emergency

Waltham Forest is committed to reaching net zero carbon emissions by 2030. To achieve this bold target, we need to translate ambition into action. Our Climate Action Plan sets out 20 actions, across four areas, which we will take to make this happen: https://www.walthamforest.gov.uk/sites/default/files/2023-01/Waltham%20Forest%20Climate%20Action%20Plan%20%28Desktop%29.pdf

Appendix A   Details of Monitoring Site Quality QA/QC

A.1   Automatic Monitoring Sites

The three automatic monitoring sites in the London Borough of Waltham Forest are currently part of the Air Quality England Network operated by Ricardo Energy & Environment. Ricardo Energy & Environment are the current data management providers. The data has traceability to national standards and operational procedures defined for the AURN network. All the monitoring sites are currently audited by Ricardo Energy & Environment. Data from the Council's automatic monitoring data can be found on the following site: http://www.airqualityengland.co.uk/

The sites are serviced every six months and are calibrated every 2 weeks by our current service and maintenance provider, Matts Monitors.

PM$_{10}$ Monitoring Adjustment

Ricardo Energy & Environment add the Volatile Correction Model (VCM) for correction of conventional TEOM PM10 datasets to the Air Quality England web pages. This function automates the VCM process and enables near real time VCM corrected TEOM datasets and statistics to be generated and downloaded. Annually, when AURN FDMS TEOM datasets on which the model is based are ratified, the provisional VCM corrected data will be replaced by ratified VCM corrected datasets.

Ricardo Energy & Environment version of the VCM model follows best practice as advised by Defra and will use available FDMS data as set out within the guidance. For example, the model uses the volatile fraction measured by FDMS analysers within a 130 km range where available. This process will correct conventional TEOM measurement to account for the loss of the volatile component of particulate matter due to the high sampling temperatures generated by the TEOM instrument

A.2   Diffusion Tubes

The Council currently uses Gradko International for the supply and analysis of its diffusion tubes. The tubes are prepared using a 20%TEA/water solution. Gradko International is UKAS accredited and follows the procedures set out in the Practical Guidance.

Refer to https://laqm.defra.gov.uk/wp-content/uploads/2023/03/Database_Diffusion_Tube_Bias_Factors_v03_23-FINAL.xlsx for the summary of precision results for nitrogen dioxide diffusion tube collocation studies. Precision Summary Table in https://laqm.defra.gov.uk/air-quality/air-quality-assessment/precision-and-accuracy/#SummaryPrecision

demonstrates Gradko International's performance summary for WASP/AIR quality scheme.

Table L. Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/22	0.83
2021	National	03/22	0.84
2020	National	09/21	0.81
2019	National	06/20	0.93
2018	National	03/19	0.93
2017	Local	-	0.89
2016	Local	-	0.94
2015	Local	-	0.88

A.3   Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

Where data capture is less than 75% and greater than 25% of a full calendar year (between 3 and 9 months), the mean should be "annualised" – i.e. adjusted using the methodology outlined in LLAQM.TG(19) before being compared to annual mean objectives.

Table M was completed using the outputs from the LAQM annualisation tool. The tool should be used to ensure the correct methodology for the annualisation off diffusion tubes is utilised, the tool can be downloaded from https://laqm.defra.gov.uk/air-quality/air-quality-assessment/annualisation-tool/.

Distance Adjustment

If an exceedance is measured at a monitoring site which is not representative of public exposure, use the procedure specified in LLAQM.TG(19) to estimate the concentration at the nearest receptor and describe the process followed here. Table N was completed using the outputs from the NO_2 fall off with distance tool, the tool can be downloaded from https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html.

Table M. Short-Term to Long-Term Monitoring Data Adjustment

Site ID	Annualisation Factor Dawlish Road	Annualisation Factor Leyton	Average Annualisation Factor	Raw Data Annual Mean (µg m^{-3})	Annualised Annual Mean (µg m^{-3})	Comments
A2	1.1378	1.0606	1.0992	25.1	27.6	
A17	0.9429	0.9662	0.9546	40.1	38.3	
A23	1.1378	1.0606	1.0992	19.5	21.5	
E27	0.9508	0.9643	0.9576	37.7	36.1	

Table N. NO₂ Fall off With Distance Calculations

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted (µg m⁻³)	Background Concentration (µg m⁻³)	Concentration Predicted at Receptor (µg m⁻³)	Comments
A26	0.8	6.8	36.3	20.0	29.6	
E25	0.4	45.4	36.2	20.0	23.2	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
E26	2.5	57.5	36.6	20.0	N/A	Warning: Receptor to kerb must be between 0.1m and 50m to calculate concentration. Please check distances and update STEP 2 - Diffusion Tube Inputs tab Columns Distance to Relevant Exposure and Distance to Kerb of Nearest Road
WL4	0.5	11	42	20	29.5	

Appendix B   Full Monthly Diffusion Tube Results for 2022

Table O. NO₂ Diffusion Tube Results

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data	Annual mean – bias adjusted
A1		75.0			33.2	23.9	23.8	23.5	26.7	26.1	29.9		38.9	38.9	29.4	24.4
A2		67.3			32.8	27.2	21.7	19.6	22.6	17.5	26.1			33.7	25.1	22.9
A3		92.3		28.4	30.4	25.4	23.5	21.3	24.6	23.2	25.9	32.4	30.9	33.0	27.2	22.6

A4		100.0	**44.1**	31.7	39.2	27.3	28.0	27.6	32.4	30.4	38.5	**46.0**	**42.4**	**43.9**	36.0	29.9
A5		92.3		28.9	41.9	30.3	25.6	25.6	32.5	30.1	31.3	38.5	36.7	39.9	32.8	27.3
A6		92.3		35.7	37.0	32.3	31.7	29.3	34.9	32.7	35.5	39.9	**43.8**	**44.5**	36.1	30.0
A7		100.0	37.9	27.6	26.7	21.0	20.0	18.6	19.7	19.1	23.0	32.3	34.7	32.1	26.1	21.6
A8		9.6												44.5	-	-
A9		75.0		22.8	23.9	17.3	14.4	12.7	13.3	15.1	18.3			43.6	20.1	16.7
A10		92.3	36.0	22.8	29.8	23.2	20.2	17.0	19.0	19.9		28.8	27.8	32.8	25.2	20.9
A11		100.0	37.4	27.3	29.1	22.6	19.8	17.9	17.9	19.2	21.9	30.0	32.9	34.6	25.9	21.5
A12		84.6		31.9	37.7	28.3	27.6	22.3	25.7		28.8	34.5	34.2	39.8	31.1	25.8
A13		100.0	37.7	25.7	27.0	19.8	17.9	15.8	17.3	18.7	23.0	31.0	29.4	34.4	24.8	20.6
A14		100.0	38.0	26.5	29.5	21.5	19.3	17.5	20.4	20.7	23.0	30.6	31.9	28.6	25.6	21.3
A15		100.0	34.5	24.6	29.9	20.6	16.9	15.2	18.2	19.6	21.3	27.1	27.5	32.1	24.0	19.9
A16		92.3		27.4	33.5	26.6	23.3	19.9	21.5	22.8	26.3	28.6	29.2	33.2	26.6	22.1
A17		63.5	**46.5**	39.2	35.3				35.7	31.5	**40.1**	**46.1**	**46.4**		**40.1**	31.8
A18		100.0	**51.4**	37.7	35.6	30.5	29.8	27.0	30.7	30.1	32.4	**42.0**	**42.5**	42.0	36.0	29.9
A19		100.0	39.2	24.8	30.7	21.0	19.4	16.8	18.4	18.1	24.4	29.1	31.3	35.9	25.8	21.4
A20		100.0	33.9	23.5	28.2	19.9	17.4	15.0	17.7	18.0	21.4	28.6	28.3	31.9	23.6	19.6
A21		92.3		34.2	39.6	29.6	28.8	30.3	33.7	32.2	38.8	47.0	46.7	47.1	37.1	30.8
A22		100.0	**40.7**	30.4	31.9	25.9	25.1	19.8	24.5	24.1	26.3	34.9	35.2	35.5	29.5	24.5
A23		67.3			26.2	19.0	14.3	13.6	14.8	16.0	20.7			31.5	19.5	17.8
A24		92.3	33.1		27.2	18.3	15.3	13.1	14.9	16.2	19.7	25.3	26.6	28.7	21.7	18.0
A25		92.3	**46.1**	30.3	31.8	29.9	27.3	25.0	27.0	28.1	31.4	33.2		36.3	31.5	26.1
A26		100.0	**57.2**	**42.3**	**40.9**	36.2	38.8	33.3	**43.8**	36.0	**46.5**	**50.8**	**50.3**	**48.7**	**43.7**	36.3
A27		92.3	37.8	33.7		26.7	25.7	23.4	25.4	25.3	31.0	36.7	36.1	38.9	31.0	25.7
A28		92.3		**43.8**	41.9	38.4	36.9	33.9	38.6	34.9	**40.8**	**46.8**	**47.9**	**47.1**	**41.0**	34.0
A29		92.3	**43.6**		29.1	26.0	25.8	23.1	25.9	23.4	31.7	36.5	36.5	36.8	30.8	25.5
A30		17.3		30.3										31.7	-	-
A31		100.0	**45.9**	32.0	31.3	26.0	25.2	24.0	25.1	23.9	25.9	28.8	32.3	33.8	29.5	24.5
E1		100.0	**53.4**	36.3	**41.0**	**41.0**	35.0	33.1	**40.4**	36.0	39.1	**45.6**	**43.7**	**44.5**	**40.8**	33.8
E2		90.4	31.7	19.9	12.6		13.2	11.5	13.8	14.6	19.4	25.6	22.5	27.7	19.3	16.0
E3		92.3	31.0		25.0	16.4	14.0	12.8	14.5	15.3	19.4	23.5	27.8	29.2	20.8	17.3

E4		100.0	35.5	21.6	33.0	27.1	20.4	20.6	25.2	26.3	27.8	31.3	29.5	36.0	27.9	23.1
E5		92.3	27.7		27.6	18.2	15.8	13.3	16.3	17.5	20.7	27.6	26.9	32.3	22.2	18.4
E6		100.0	**41.7**	31.7	34.9	27.1	29.8	28.3	31.4	27.6	39.1	**40.6**	**42.1**	**41.6**	34.7	28.8
E7		100.0	**40.6**	28.5	32.1	27.2	27.1	23.9	25.9	24.0	27.7	35.9	36.0	36.6	30.5	25.3
E8		92.3	**41.6**		34.2	24.9	23.1	20.5	23.0	25.5	29.4	35.8	32.5	37.5	29.8	24.8
E9		100.0	**42.6**	27.8	34.3	27.6	22.3	20.1	26.6	26.2	32.4	35.3	36.5	38.3	30.8	25.6
E10		100.0	**49.5**	35.2	45.0	34.8	34.5	30.9	**40.2**	36.1	38.0	**45.4**	**44.1**	**43.6**	39.8	33.0
E11		82.7	**42.8**	34.0	37.0		31.9		26.4	26.9	30.7	37.5	36.4	37.8	34.2	28.3
E12		92.3		22.8	24.8	18.5	19.6	17.5	17.9	17.5	22.9	27.7	29.1	30.1	22.6	18.7
E13		92.3	39.2	28.7		24.9	21.9	20.7	23.4	23.3	31.9	33.5	35.3	39.0	29.2	24.3
E14		100.0	**40.2**	27.6	33.4	28.9	26.8	25.9	30.4	28.0	36.0	35.3	35.3	37.8	32.1	26.7
E15		92.3		27.5	35.7	31.6	25.4	22.2	27.4	28.4	30.8	33.6	32.2	37.1	30.2	25.0
E16		100.0	**47.3**	36.4	**42.6**	**40.7**	33.5	34.0	**41.5**	39.2	**44.3**	**44.8**	**48.4**	**45.9**	**41.6**	34.5
E17		100.0	**43.0**	33.8	36.7	33.9	33.4	33.0	36.3	32.6	36.8	**49.2**	**48.5**	**45.4**	38.6	32.0
E18		92.3		38.6	**43.0**	35.9	35.8	28.2	34.2	31.5	34.9	**44.4**	**46.2**	**43.6**	37.8	31.4
E19		100.0	38.5	28.8	29.0	20.4	19.9	17.8	18.9	18.3	23.6	30.4	31.1	33.5	25.8	21.4
E20		75.0		25.1	23.6	17.2	18.5	16.2	17.0	16.3	22.4			30.3	20.7	17.2
E21		92.3		**40.4**	**44.5**	39.4	**40.4**	35.9	**42.3**	37.0	**40.7**	**46.3**	**46.0**	**51.2**	**42.2**	35.0
E22		92.3		35.6	40.0	32.8	32.5	32.4	38.7	34.4	41.6	47.0	42.8	47.2	38.6	32.1
E23		92.3	**43.5**	32.1	32.2	30.6	28.8	26.6	31.6	27.2	32.1	**40.7**		38.1	33.0	27.4
E24		100.0	37.1	30.3	53.7	27.1	22.2	39.4	48.5	26.5	32.6	38.4	38.5	41.3	36.3	30.1
E25		100.0	**56.9**	**45.8**	**44.0**	**40.5**	**40.4**	21.3	27.2	**42.4**	**51.4**	**48.5**	**52.7**	**52.1**	**43.6**	36.2
E26		100.0	**49.9**	**42.9**	**41.6**	**47.8**	33.0	31.1	47.5	37.5	**47.1**	**50.4**	**52.7**	**47.7**	**44.1**	36.6
E27		67.3	**45.7**	**43.3**	36.1	36.1	36.5	32.9			30.7			**40.5**	37.7	30.0
E28		92.3	36.5		29.1	20.1	15.5	13.0	15.7	16.6	25.0	28.4	31.2	34.6	24.2	20.0
E29		100.0	**40.7**	27.2	29.2	21.2	18.4	16.2	16.9	16.9	23.2	30.0	32.1	33.6	25.5	21.1
E30		90.4	**40.5**	25.0	24.3	22.0	18.9	16.2	17.7	17.6	24.3		28.7	34.4	24.5	20.4
E31		92.3		34.4	**46.1**	43.6	33.4	31.5	**42.1**	**41.0**	**42.3**	**45.4**	**41.9**	**45.1**	**40.6**	33.7

Notes

Concentrations are presented as µg m^{-3}.

Exceedances of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in **bold and underlined.**

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%.

(a) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).